

Optical Design of an Imaging Spectrometer utilizing an Acousto Optical Tunable Filter (AOTF)  
as a Disperser

25 word Abstract

Imaging spectrometer design, utilizing an AOTF. Fully achromatized and diffraction limited system from 1.3-2.2 microns. The +1 and -1 orthogonal polarization orders use a single focal plane.

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Designing an imaging spectrometer using an AOTF can be a difficult task since there ~~is~~ *IS NOT* software that can simulate the bulk diffraction that can take place in the AOTF material. In this paper I will describe the method used to simulate the effects of the AOTF using a refractive grating at the center of the AOTF material.

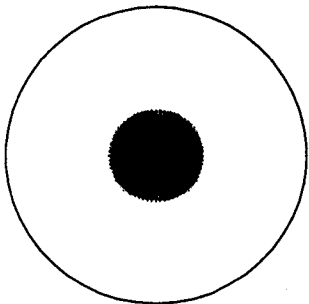
The whole system is achromatized from 1.3-2.2 microns using only 2 types of glass one of which is BK7. The attached spot diagram shows that this is the case. This +1 and -1 orders produced by this AOTF happen to be orthogonally polarized, giving extra information than may be useful in certain applications.

Furthermore the two orthogonal output polarization states of the +1 and -1 diffraction orders are imaged onto the same focal plane, thus eliminating the need for a second focal plane, resulting in considerable savings in cost and mass. A layout of the system and the way it is folded can be seen in the attached layout diagram. The focal plane has 256x256 pixels with pixel size of 40 microns.

The system has been designed, built and used and results will be shown at the conference. I will also describe the specific AOTF used with its different refractive  $n_e$  and  $n_o$ .

The research described in this paper was carried out by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

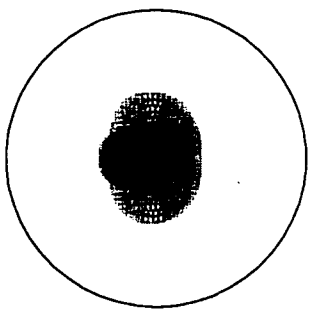
OBJ : 0.0000 DEG



100.00

IMA : 0.000 MM

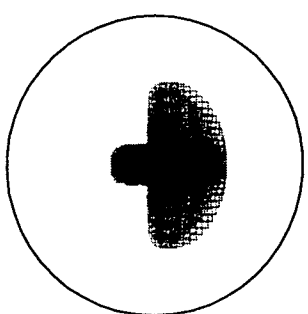
OBJ : 1.4000 DEG



IMA : -2.784 MM

+	1.3000
✓	1.4000
□	1.6000
z	1.8000
x	2.0000
II	2.2000

OBJ : 2.0000 DEG



SURFACE : IMA

IMA : -3.980 MM

SPOT DIAGRAM

LENS HAS NO TITLE.  
MON DEC 22 1997 UNITS ARE MICRONS.  
FIELD : 1  
RMS RADIUS : 4.881 5.049 2  
CEO RADIUS : 8.490 12.685  
AIRY DISK : 31.18

REFERENCE : CHIEF RAY

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NOT TO SCALE

